Thermal Expansion of Solid Solutions of Gadolinium Sulfides at High Temperatures

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The possibility of directional cationic doping of sulfides of rare-earth metals having defective structure Th_3P_4, allows one to adjust a ratio of structural vacancies for both density and mobility of carriers of current, operating thus by thermal and thermoelectric properties of high-melting materials. This has opened the possibility of using compositions of rare-earth metals as highly-effective thermoelectrical materials operating at high temperature ($T \geq$ 1000 K).

In this paper the results of experimental investigations of the temperature dependence of the thermal expansion coefficient (TEC) of solid solutions of gadolinium sulfides GdS_x, ($1.47 \leq x \leq < 1.5$) in the temperature range (300-900 K) are reported.

The measurements of (TEC) are carried out with a quartz dilatometer with a capacitor gauge operating in modes of monotonic heating and cooling. The samples represented large-block polycrystals, produced by a method of crystallization from melt. The experimental results are processed on the computer by a least squares method, and polynomials describing the dependence (TEC) on temperature are reported. The nonmonotonic behavior of the temperature dependence (TEC) in the interval 600-700 K is observed. It is shown that for the structures of solid solutions of GdS_x the dominating contribution to the dependence of the thermal expansion coefficient (TEC) on composition introduces the defects of structure.